Original Research Article

"COMPARATIVE STUDY OF CASEIN PROTEIN CONTENT OF MILK OF DIFFERENT DOMESTICATED COW, BUFFALO AND GOAT BREEDS FROM SOUTH-WEST PART OF KARJAT TEHSIL, AHMEDNAGAR DISTRICT, M.S., INDIA"

ABSTRACT: *The milk is a highly nutritious liquid food synthesized by mammals in their mammary glands. The milk is a mixture of mostly water, fat, proteins, minerals, vitamins and other biomolecules in trace. The casein and whey proteins are two major types of proteins present in milk. Both of these proteins are essential in growth and metabolism of healthy person. Casein protein is comprising large share of total protein of milk. Casein contains all the essential amino acids in high ratio. The present study was carried out from March 2022 to April 2022 to compare the various milk samples for their casein content. The selected sampling sites for milk collection were Karjat (S1), Kuldharan (S2), Rashin (S3) and Khed (S4). The precipitation of casein was occurred at pH 4.4 to 4.6 equal to its isoelectric pH. The milk samples were first centrifuged to remove fats and then subjected to 2% Hydrochloric acid slowly to lower its pH. The casein content found was highest for the milk samples of goat breeds than that of buffalo and cow breeds.*

Keywords: *Isoelectric Point, Osmanabadi, Khillar, Casein Protein,Beetal.*

Comment [h1]: Is it Khillar or "Khillari"

Comment [h2]: "Breeds" of goats and cows would be more appropriate.

I. INTRODUCTION

Karjat Tehsil is situated in southern part of Ahmednagar district. This is drought prone Tehsil. Climatically Karjat Tehsil is hot and dry in general. The maximum temperature recorded in the month of May rises to about 40° C while the lowest temperature recorded in the month of January goes down to 12°C. The district is one of the drought prone districts of the state due to uncertain and uneven distribution of rainfall. It receives an annual average rainfall of about 700 mm. Since human civilization, humans are succeeded to keep or domesticate the animals that are useful for mankind. Their byproducts like milk, meat, coat, fat, horns, etc. are useful in day today life since its use had determined. The most common animals that are reared by human being are cow, buffalo, sheep, goat and their variant species.

India has lots of genetic variation and diversity among the cattle breeds (Shah *et al.* 2012) that are adapted to the environment in which they survive. The buffalo that mostly domesticated in India is Asian river water buffalo. Asian water buffalo was the main milk source among Indian peoples for many years (N.G. Hegde 2019). India has nearly 34 well recognized goat breeds that are reared for meat, milk and skin purposes (Singh *et al.* 2019). Operation Flood, initiated in India on 13 January 1970, was the world's largest dairy development program and a pioneer in the history of India's National Dairy Development Board. The program led India from 50th to the largest producer of milk in the world in just a couple of decades. To increase the milk production, various cross breeds like Holstein Frisian and Jersey were introduced meant for milk. The breeds of cow that are popular at Karjat Tehsil are Gir, Sehwal, Khillari, Holstein Friesian, Jersey. Similarly in buffalo; Murrah, Pandharpuri and in goat: Beetal, Osmanabadi, Surti, Kathiyawadi, Jamanpari, Boer.

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The milk is very rich in various nutrients that are needed for animals, including humans for the normal body function (Gakkhar *et al.*2015). Goat milk is rich in various nutritional factors like proteins, vitamins (E and C), flavonoids and carotenoids having antioxidant properties. Hence goat milk help to protect consumers from exposure to oxidative stress, which occurs in many acute and chronic diseases (Dalle *et al.* 2006; Valko *et al.* 2007). Due to short shelf life, the milk is converted to its processed products like cheese, whey which has higher nutritional value important for normal physiological activities of human body like blood pressure, immunity, inflammatory actions (Athira *et al.* 2015).

There is always a point of interest towards the research or studies regarding health and beauty products. Casein protein is one of the most interested food supplement product used in fitness and health issues. Patni *et al.* 2015also accounted the use of casein protein micelles as biodegradable plastic when treated with small amount of clay and a reactive molecule formaldehyde. Besides this, all the essential amino acids needed for maintaining healthy growth of human body were found present in casein protein (Petrotos *et al.* 2014).

The casein is proved to be the major constituent of the milk and it is almost found 80 % of total milk protein (Jabeen *et al.* 2020). The casein micelles that are being precipitated at isoelectric pH contains αS1 casein, αS2 casein, β casein and κ casein. While the casein is composed of all the essential amino acids like Leucine, Isoleucine, Lysine, Valine, Phenylalanine, Threonine, Methionine and Tryptophan. The various functional peptides from protein casein have many beneficial roles in human health; e.g. antimicrobial peptides help in immune system and antithrombotic peptides works in

cardiovascular system (Petrotos *et al.* 2014). The contents of various food supplements might be seen playing key role in maintaining net protein and amino acid balance of body (Babault *et al.* 2014).

The present study was about the comparative study of casein protein content of milk samples collected from different breeds of domesticated dairy animals like goat, cow and buffalo of different locations in Karjat Tehsil.

II. MATERIALS AND METHODS

Study Area:

The milk samples were collected from four sampling sites, abbreviated as S1 (Karjat) , S2 (Kuldharan), S3 (Rashin) and S4 (Khed) for two months i.e. March and April of the year 2022. The geographical coordinates were S1 (18.5522° N, 75.0101° E), S2 (18.5362° N, 74.8646° E), S3 (18.4377° N, 74.9238° E) and S4 (18.3814° N, 74.8171° E).

Fig. 1- Location map for selected sampling sites of south-west Karjat Tehsil.

Sterilized bottles were used to collect the fresh milk samples from two species each of Buffalo, Cow and Goat (Mahmood *et al*., 2010). The method of precipitation of casein protein in milk by lowering the pH of milk to 4.6 (by using 2% HCl) was used as suggested by S. Patil *et al.* 2019, N. Jamil *et al.* 2015, A. Kumaresan *et al.* 2017, M. Jabeen *et al.* 2020.

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III. RESULTS AND DISCUSSION:

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Casein Protein was measured by using iso-electric point method in lab. 2% HCl is used for lowering the pH of milk sample to 4.6 so as to precipitate the casein. The value of casein protein for milk of buffalo breeds ranges between 4.06 g/100ml to 8.22 g/100ml of milk. For the milk of cow breeds it is 2.74 g/100ml to 5.24 g/100ml of milk. And it is 3.44 g/100ml to 9.80 g/100ml of milk for goat breeds. The minimum value of protein casein was 2.74 g/100ml of milk found for the HfX cow milk at Karjat (S1) (Table: 1, Fig.1). The maximum amount of protein casein i.e. 9.80 g/100ml of milk was found for the milk of Osmanabadi goat at Khed (S4) (Table: 1, Fig.2). The amount of casein protein obtained in present study shows resemblance with the values of casein found by Jabeen *et al.* (2020)for milk samples of cow, buffalo and goat.

Comment [h6]:

The mean value of casein content during entire study period was observed as 5.8275 ± 1.37583 for milk of buffalo breeds, 4.265 ± 0.886131 for milk of cow breeds and 6.7875 ± 2.062452 for milk

of goat breeds. It can be said that the casein availability in these milk samples is higher in goat breeds as compared to buffalo breeds and is lower in cow breeds, i.e. casein in milk of goat breeds > buffalo breeds > cow breeds.

Table 1: Variations in casein content of milk samples. (**Holstein Friesian X**: Holstein Friesian Crossbreed, **SD**: Standard Deviation).

Animal Breed	**Murrah Buffalo**				**Pandharpuri Buffalo**				**Mean**	**SD (±)**
Site	S1	S2	S3	S4	S1	S2	S3	S4		
Casein (g/100ml)	5.46	4.86	6.36	4.7	4.06	7.16	5.8	8.22	5.8275	1.37583
Animal Breed	**Holstein Friesian X Cow**				**Khillar Cow**				**Mean**	**SD (±)**
Site	S1	S2	S3	S4	S1	S2	S3	S4		
Casein (g/100ml)	2.74	4.42	3.38	5.24	3.84	4.78	4.5	5.22	4.265	0.886131
Animal Breed	**Osmanabadi Goat**				**Beetal Goat**				**Mean**	**SD (±)**
Site	S1	S2	S3	S4	S1	S2	S3	S4		
Casein (g/100ml)	7.96	8.94	6.22	9.8	4.96	7.2	3.78	5.44	6.7875	2.062452

Comment [h7]: Two decimal places for uniformity. "4.70, 5.80.

Comment [h8]: "Khillari" instead of "khallar"

Fig. 2: Graph showing variations in amount of casein in the milk samples of various breeds under study.

IV. CONCLUSION:

In this research study the milk samples from different breeds of buffalo (Murrah and Pandharpuri), cow (HfX and Khillar) and goat (Osmanabadi and Beetal) were collected at different four sites S1 (Karjat), S2 (Kuldharan), S3 (Rashin) and S4 (Khed) in two months i.e. March and April of the year 2022 and the differencein the amount of casein protein (g/100ml)were measured. It is found that, among the breeds of buffalo, milk of Pandharpuri buffalo yields somewhat higher amount of casein protein than Murrah buffalo milk. Similarly, Milk of Khillar cattle gives more casein as compared to HfX cow milk. Also, it can be said thdat milk of Osmanabadi goat shows higher proportion of casein protein relative to that of Beetal goat milk. From the readings of the present research work, it can be concluded that, goat milk yields relatively higher amount of casein protein than cow and buffalo milk. Such data could be useful for the idea and planning about the casein extraction and availability of casein in milk of different types of dairy animals.

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V. REFERENCES

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